

I claim,

1. A CMOS image sensor comprising,  
a plurality of active pixels each having an output, each active pixel  
including,

5 a first circuit that produces a signal proportional to incident  
light intensity, said proportional signal capable of being applied to  
said active pixel output,

a reset transistor for resetting said active pixel,  
at least one select signal coupled to said pixels for selecting at least one  
10 pixel from said plurality of pixels,

an amplifier having,

a first input for receiving said outputs of said active pixels,  
an output coupled to said reset transistors providing a negative  
feedback to said selected pixel ,

15 a reset reference voltage applied to said amplifier to provide a reference to  
reset said active pixels.

2. The CMOS image sensor of claim 1 in which said amplifier further includes  
a second input receiving said reset reference voltage.

20 3. The CMOS image sensor of claim 2 in which said reset transistor has a gate  
and first and second terminals, said negative feedback provided to said first  
terminal to adjust the voltage at said second terminal of said reset transistor to a  
reset voltage.

25 4. The CMOS image sensor of claim 1 or 3 in which said voltage at said  
second terminal is  $V_T - \Delta V$  below the voltage applied at said gate terminal of said  
reset transistor, where  $V_T$  is the threshold voltage of said reset transistor,

and  $\Delta V$  keeps the reset transistor in the subthreshold region in the steady state of the reset phase.

5      5.      The CMOS image sensor of claim 4 in which  $\Delta V$  is greater than one hundred millivolts.

6.      The CMOS image sensor of claim 4 in which each pixel further comprises a row select transistor coupled to said first input of said amplifier.

10      7.      The CMOS image sensor of claim 6 having a source follower transistor coupled between said second terminal and said row select transistor.

15      8.      The CMOS image sensor of claim 3 in which said first circuit is a photocircuit

9.      The CMOS image sensor of claim 8 in which said amplifier is a differential amplifier in which said first input of said differential amplifier is applied to a first differential amplifier input transistor and said second input of said differential amplifier is applied to a second differential amplifier input transistor, said first and  
20      second differential amplifier input transistors cooperating to provide a current to a current mirror circuit which provides said negative feedback to said reset transistor.

25      10.      The CMOS image sensor of claim 8 in which said photocircuit includes a photodiode and capacitance.

11.      The CMOS image sensor of claim 7 in which said first circuit is a photocircuit

12. The CMOS image sensor of claim 11 in which said photocircuit includes a photodiode and capacitance.
13. A CMOS image sensor array having rows and columns of active pixels,  
5 comprising,  
    one or more column lines,  
    multiple active pixels each having an output, the outputs of each active pixel in a column connected to a column line, each said active pixel including,  
        a first circuit that produces a signal proportional to incident  
10 light intensity, said proportional signal capable of being applied to said active pixel output,  
        a reset transistor for resetting said active pixel,  
    one or more amplifiers, each said amplifier having a first input coupled to a each said column line, said amplifier providing a negative feedback to each said  
15 reset transistor of said respective column,  
    a reset reference voltage applied to said amplifier to provide a reference to reset said active pixels .
14. The CMOS image sensor of claim 13 in which said amplifier further  
20 includes a second input receiving said reset reference voltage.
15. The CMOS image sensor of claim 14 in which said reset transistor has a gate and first and second terminals, said negative feedback provided to said first terminal to adjust the voltage at said second terminal of said reset transistor to a  
25 reset voltage.
16. The CMOS image sensor of claim 13 or 15 in which said voltage at each said second terminal is  $V_T - \Delta V$  below the voltage applied at said gate terminal of said reset transistor, where  $V_T$  is the threshold voltage of said reset

transistor, and  $\Delta V$  keeps said reset transistor in the subthreshold region in the steady state of the reset phase.

5 17. The CMOS image sensor array of claim 15 in which  $\Delta V$  is greater than one hundred millivolts.

10 18. The CMOS image sensor array of claim 16 in which each active pixel has a row select transistor coupled between said second terminal and said first input of said amplifier.

19. The CMOS image sensor array of claim 18 in which each active pixel has a source follower transistor coupled between said second terminal and said row select transistor.

15 20. The CMOS image sensor array of claim 16 in which said first circuit in each active pixel is a photocircuit

20 21. The CMOS image sensor array of claim 20 in which said amplifier is a differential amplifier in which said first input of said differential amplifier is applied to a first differential amplifier input transistor and said second input of said differential amplifier is applied to a second differential amplifier input transistor, said first and second differential amplifier input transistors cooperating to provide a current to a current mirror circuit which provides said negative feedback to said reset transistor.

25 22. The CMOS image sensor array of claim 20 in which said photocircuit in each active pixel includes a photodiode and capacitance.

23. The CMOS image sensor array of claim 19 in which each said first circuit is a photocircuit
24. The CMOS image sensor array of claim 23 in which each said photocircuit  
5 includes a photodiode and capacitance.
25. A CMOS image sensor array having rows and columns of active pixels, comprising,  
one or more row lines,  
10 multiple active pixels each having an output, the outputs of each active pixel in a row connected to a row line, each said active pixel including  
a first circuit that produces a current proportional to incident light intensity, said proportional current capable of being applied to said active pixel output,  
15 a reset transistor for resetting said active pixel,  
one or more amplifiers, each said amplifier having a first input coupled to a each said row line, said amplifier providing a negative feedback to each said reset transistor of said respective row,  
a reset reference voltage applied to said amplifier to provide a reference to  
20 reset said active pixels.
26. The CMOS image sensor of claim 25 in which said amplifier further includes a second input receiving said reset reference voltage.
- 25 27. The CMOS image sensor of claim 26 in which said reset transistor has a gate and first and second terminals, said negative feedback provided to said first terminal to adjust the voltage at said second terminal of said reset transistor to a reset voltage.

28. The CMOS image sensor of claim 25 or 27 in which said voltage at said second at each said second terminal is  $V_T - \Delta V$  below the voltage applied at said gate terminal of said reset transistor, where  $V_T$  is the threshold voltage of said reset transistor, and  $\Delta V$  keeps the reset transistor in the subthreshold region in the steady state of the reset phase.

29. The CMOS image sensor array of claim 27 in which  $\Delta V$  is greater than one hundred millivolts.

30. The CMOS image sensor array of claim 28 in which each active pixel has a column select transistor coupled between said second terminal and said first input of said amplifier.

31. The CMOS image sensor array of claim 30 in which each active pixel has a source follower transistor coupled between said second terminal and said column select transistor.

32. The CMOS image sensor array of claim 28 in which said first circuit in each active pixel is a photocircuit.

33. The CMOS image sensor array of claim 32 in which said amplifier is a differential amplifier in which said first input of said differential amplifier is applied to a first differential amplifier input transistor and said second input of said differential amplifier is applied to a second differential amplifier input transistor, said first and second differential amplifier input transistors cooperating to provide a current to a current mirror circuit which provides said negative feedback to said reset transistor.

34. The CMOS image sensor array of claim 32 in which said photocircuit in each active pixel includes a photodiode and capacitance.

5 35. The CMOS image sensor array of claim 31 in which each said first circuit is a photocircuit.

36. The CMOS image sensor array of claim 35 in which each said photocircuit includes a photodiode and capacitance.

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